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ADDITIONS TO THE FAUNA OF THE LOWER PLIOCENE SNAKE CREEK BEDS (RESULTS OF THE PRINCETON UNIVERSITY 1914 EXPEDITION TO NEBRASKA).

BY WILLIAM J. SINCLAIR.

(*Read April 24, 1915.*)

One of the objects of the Princeton University 1914 Geological Expedition to Nebraska was to acquire, if possible, fossil bones from the Lower Pliocene Snake Creek beds of Sioux County, partly to fill out the exhibition and study collections of the Department of Geology, which were lacking in Pliocene vertebrates, and, partly, to obtain some additional light on the fauna of the Great Plains region in Lower Pliocene time, with the purpose of establishing a broader basis for the correlation of Continental Interior and Pacific Coast Tertiary deposits. In both respects the expedition was thoroughly successful, which I attribute, in large part, to the enthusiastic support of my assistants, Messrs. A. C. Whitford, of Lincoln, Nebraska, and Mr. Charles Barner, of Agate, and to the kindness of our temporary neighbors, the various ranchmen on whose ranges the bonebearing deposits lie.

The Snake Creek beds were named and described by Matthew and Cook,[1] and reference should be made to their paper for details not brought out in the pages which follow. The four exposures worked by the Princeton party lie within the limits of the Whistle

[1] "A Pliocene Fauna from Western Nebraska," *Bull. Am. Mus. Nat., Hist.*, N. Y., Vol. XXVI., Art. XXVII., pp. 361–414, 1909.

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Creek quadrangle, south of the sandhills on the divide between the Niobrara and the North Platte rivers, in draws at or near the heads of Dry Spotted Tail Creek, Spotted Tail Creek and Snake Creek, as follows: Loc. 1000A, T. 26 N., R. 55 W., Sec. 31 (N. E. ¼); Loc. 1000B, same township and range, but in the southeast quarter of Sec. 33; Loc. 1000C, T. 25 N., R. 55 W., Sec. 3 (S. E. ¼ to middle of section); Loc. 1000D, T. 25 N., R. 54 W., Sec. 2 (N. E. ¼). Of the four, Loc. 1000C, to which the attention of Messrs. Whitford and Barner was called by Mr. John Weir, before my arrival in the field, was particularly productive, yielding some of our best material.

The Snake Creek beds comprise unconsolidated, water-worn gravels, clean, cross-bedded, round-grained sands sometimes streaked with magnetic, and a mortar-like, gray-white material, sometimes in angular fragments and sometimes in cobbles or boulder-like masses, resting with marked erosional unconformity on the Middle Miocene Sheep Creek beds. Rolled pebbles of granite, quartzite, etc., indicate water transportation from the crystalline rocks of the mountains farther west, probably some of the sand is windborne, but a large part of the Snake Creek matrix has not been transported far and consists, sometimes, of subangular fragments resembling in appearance dried mortar, and, sometimes, of gravels, cobbles, and large masses of more or less indurated clay or silt, evidently represented the harder portions of the Sheep beds through which the Snake Creek channels were cut. Many large, slightly rounded masses of Sheep Creek sediment incorporated in the Snake Creek sands and gravels are quite incoherent and could not have stood thorough saturation with water, not to mention transportation to any considerable distance. I think they were derived from the caving of undercut banks along channels incised in the Sheep Creek. Water-worn fragments of silicified wood are common, but are not necessarily remains of a forest contemporary with the Lower Pliocene fauna. Most of it, if not all, is *remanie* material.

The stratification is lenticular, water-worn gravels giving place laterally to cross-bedded sands and jumbled masses of clay boulders. Either gravels, sands or mortar-like fragments may rest with clean sharp contact on the eroded surface of the Sheep Creek, the irregu-

larity of which is increased by land sliding occuring along the sides of the draws where the exposures are found, but much of it is due to changes in the slope of the channel-beds in which the Snake Creek deposits accumulated. Upward, the formation merges into wind-blown sands and silts which cover the prairie top, and it is not always possible to distinguish between them, as bones sometimes occur in the lower layers of the sand above the level of the typical Snake Creek gravels.

Exposures, when found, are along the sides of the draws which have cut down through the Snake Creek beds into the underlying Sheep Creek, and are usually more or less obscured by wind-blown sand overgrown with grass and weeds, so that little in the way of fossils can be seen at the surface except an occasional weathered bone fragment on the bare spots between grass clumps. Occasionally, a larger ungrassed area of sand and pebbles may show a few horse teeth, a jaw fragment or two or the ends of some broken limb bones. All collecting was done by stripping off the surface sod and exposing the Snake Creek-Sheep Creek contact wherever the greater abundance of gravel and bone fragments suggested the presence of a productive "pocket" or lens of bone-bearing gravel. If the preliminary prospecting seemed to warrant further excavation, a large area was cleared and the bank cut back to a vertical face which was worked by undercutting at the level of the contact just mentioned. This was kept up until the productive gravel was exhausted or the repeating caving of the heavy top burden of sand made further work both laborious and dangerous.

The bones are remarkably well preserved, mostly black or of a dark color, and occur in both the gravels, sands and mortar-like conglomerate, becoming scarce as the sand gets clean or the number of clay boulders and cobbles increases. They are all more or less abraded, sometimes by water wear, at other times manifestly by wind-blown sand,[2] and vary in character from rolled bone pebbles to complete skulls. Hardly ever is there association of adjacent parts. Occasionally a *remanie* fossil, washed out of the Sheep

[2] The type skull of *Protolabis princetonianus* sp. nov. was found in soft sand, lying on the left side with the front of the skull tilted downward. The arch and back of the skull on the upper (right) side are pared down to a common level in a manner suggesting sand-blasting.

Creek, is found, but with this exception the bones seem to have been introduced directly into the streams which transported the Snake Creek gravel and, apparently, represent the fauna of the immediate vicinity, as frail teeth and delicate skull and jaw processes remain unbroken, suggesting that the bones have not been moved far. As will be seen by an examination of the Whistle Creek Quadrangle, our collecting localities are somewhat widely scattered and may not all represent the deposits of a single stream, possibly are not all strictly contemporaneous, but as our large collection from locality 1000C contains practically the same forms as are found in the remaining less fossiliferous localities, there is every reason to regard the fauna as a unit. So far as determined, the Snake Creek beds have yielded the following association of forms, those marked (*A*) being preserved in the American Museum, New York, (*P*) in the Geological Museum of Princeton University and (*C*) in the private collection of Mr. H. J. Cook, of Agate, Nebraska.

DOGS.

Amphicyon amnicola (*A*).
Amphicyon sp. indet. (*A*).
?Amphicyon sp. indesc. (*P*).
Aelurodon haydeni validus (*A*).
Aelurodon saevus secundus (*A*).
Aelurodon cf. *wheelerianus* (*P*).
Aelurodon sp. div. indet. (*A, P*).
Tephrocyon hippophagus (*A, P*).
Tephrocyon cf. *temerarius* (*A*).
Tephrocyon cf. *vafer* (*A, P*).
Tephrocyon mortifer (*C*).
Tephrocyon sp. maj. (*A, P*).
?Cyon sp. (*A*).

CIVET-CAT.

Bassariscus antiquus (*A*).

MUSTELINES.

Brachypsalis pachycephalus (*P*).
Brachypsalis obliquidens sp. nov. (*P*).
Martes glareæ sp. nov. (*P*).

CATS.

Pseudælurus near *intrepidus* (*P*).
Cat, non-machærodont (*P*).
Machærodont cat, gen. indet. (*A*).
?Felis cf. *maxima* (*A*).

RODENTS.

Mylagaulus cf. *monodon* (*A*).
Dipoides curtus (*A, P*).
Dipoides tortus (*A*).
Hystricops cf. *venustus* (*A, P?*).
Geomys cf. *bisulcatus* (*A*).

EDENTATES.

Megalonychid, gen. et. sp. indet. (*A, P*).

RHINOCEROSES.

Teleoceras sp. (*A, P*).
Aphelops sp. (*A, P*).
?Cænopus sp. (*A*).

HORSES.

Archæohippus sp. (*P*).
Parahippus cf. *cognatus* (*A, P*).
Hypohippus cf. *affinis* (*A*).
Hypohippus sp. (*P*).
Merychippus cf. *insignis* (*A, P*).
Merychippus close to *calimarius* (*P*).
Hipparion cf. *occidentale* (*A, P*).

Hipparion gratum (*A, P*).
Hipparion cf. *affine* (*A, P*).
Protohippus cf. *placidus* (*P*, probably *A*).
Protohippus near *perditus* (*P*, probably *A*).
Pliohippus cf. *mirabilis* (*P*).
Pliohippus sp. div. (*A*).

PECCARIES.

Prosthennops cf. *crassigenis* (*A*).
Prosthennops sp. (*A, P*).

OREODONTS.

Merychyus (*Metoreodon*) *relictus* (*A*).
Merychyus (*Metoreodon*) *profectus* (*A, P*).
Merychyus (*Metoreodon*) sp. (*A, P*).
Pronomotherium siouense sp. nov. (*P*).

CAMELS.

Protolabis princetonianus sp. nov. (*P*).
Pliauchenia (*Megatylopus*) *gigas* (*A, P*).
Alticamelus procerus (*A, P*).
Alticamelus sp. div. (*A, P*).
?Procamelus sp. div. (*A*).

ANTELOPES AND DEER.

Dromomeryx whitfordi sp. nov. (*P, A*).[3]
Drepanomeryx falciformis gen. et sp. nov. (*P*).
Cervus sp. (*A, P*).
Blastomeryx elegans (*A*).
Blastomeryx cf. *wellsi* (*A*).
Merycodus necatus sabulonis (*A, P*).
Merycodus cf. *necatus* (*A, P*).
Merycodus sp. div. (*A, P*).

BOVIDS.

Neotragocerus improvisus (*A, P*).
Bovid gen. indet. (*A*).
Bison sp. (*A*).

MASTODONS.

Gomphotherium sp. (*P*).
?Mastodon sp. (*P*).

BIRDS.

Aquila danana? (*P*).[4]
Buteo near *borealis* (*P*).[4]

REPTILES.

Crocodile vertebra (*P*).
Lizard jaws (*P*).
Huge land tortoise (*A, P*).

OF UNCERTAIN POSITION.

Part of large mammal jaw (*P*).

The collections obtained by the Princeton expedition have greatly increased the number of Miocene genera represented in the Snake Creek fauna. *Archæohippus* excepted, *Brachypsalis, Pseudælurus, Pronomotherium, Protolabis* and *Dromomeryx* have species in the Upper Miocene, distinct, but not strikingly different from, their Snake Creek successors, rather increasing the close relationship of the fauna with that of the Upper Miocene previously commented on by Matthew and Cook. Additional Pliocene elements are far

[3] *Palæomeryx* sp. of Matthew and Cook.

[4] Represented in the Princeton collection by a fragment of the tarso-metatarsus. Determinations by Dr. Loye Holmes Miller.

less abundant. Perhaps the new horned artiodactyl, *Drepanomeryx*, presenting a type of horn-core not hitherto known in North America, and a mastodon apparently allied to *Mastodon americanus,* may be regarded as belonging to this category. The conception of old and new faunal elements should not be unduly emphasized, because, as our exploration of the Snake Creek beds plainly shows, we do not yet know the extreme upward range in time of a number of Upper Miocene genera and can merely say of the new, supposedly Pliocene, forms that this is their first appearance. A suggestion regarding climatic conditions may be found in the presence of crocodiles and huge land tortoises, the latter rivalling in size those of the Galapagos Islands, indicating, perhaps, that the approaching chill of glacial times had not yet exterminated these cold-blooded types.

DESCRIPTIONS OF NEW GENERA AND SPECIES.

AELURODON sp. compare WHEELERIANUS?

The left ramus of a lower jar with $p_{\overline{4}}$ and $m_{\overline{1}}$ and alveoli for the remaining teeth (No. 12068 Princeton University Geological Museum, collecting locality 1000C) is referable to an *Aelurodon* of about the size of *A. wheelerianus,* from the type of which it differs in the greater length of $p_{\overline{4}}$-$m_{\overline{1}}$, the shorter jaw and the closer crowding of the premolars. It is either too small or too large to be referred definitely to any of the described species of *Aelurodon,* but is hardly complete enough to be made a new specific type.

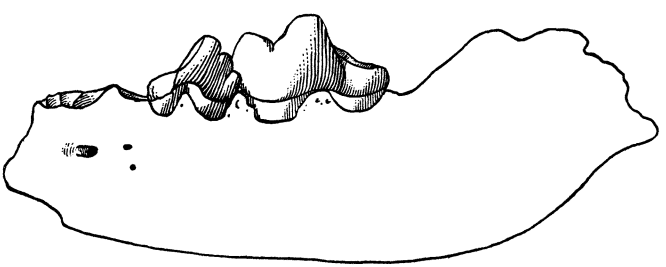

FIG. 1. *Aelurodon* sp., compare *wheelerianus?,* left ramus, side view, No. 12068, two thirds natural size.

?AMPHICYON sp. indesc.

A huge canid, possibly an undescribed species of *Amphicyon,* is represented in the Princeton Snake Creek collection by the right

ramus of the lower jaw, an ulna and some other bones, of which the lower jaw (No. 12078 Princeton University Geological Museum, collecting locality 1000C) is here figured to give some idea of its size and proportions. The fragment retains alveoli for the canine, four double-rooted premolars and the sectorial molar. The first and second premolars are separated from each other by a short space, and from the canine and first molar by long diastemata, whlie the rest of the dentition is in close series.

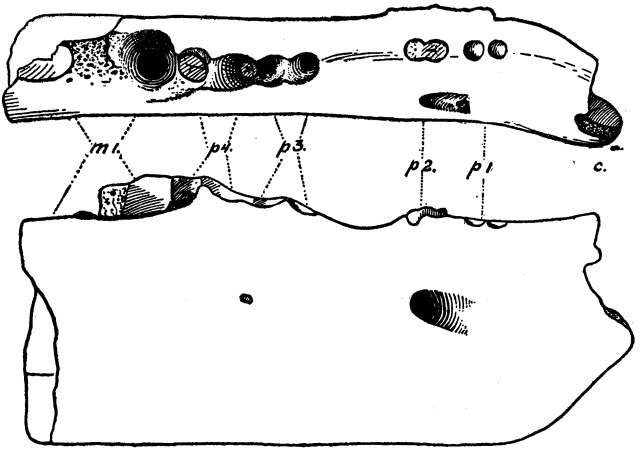

FIG. 2. *?Amphicyon* sp. indesc., No. 12078, right ramus of the lower jaw, side and top views, one half natural size.

BRACHYPSALIS OBLIQUIDENS sp. nov.

Type No. 12070 Princeton University Geological Museum, collecting locality 1000C, the left ramus of the lower jaw with $p_{\overline{2}}$-$m_{\overline{2}}$ and alveoli of the canine and first premolar (Fig. 3). This is a decidedly larger, deeper-jawed, heavier-toothed species than *Brachypsalis pachycephalus,* with the anterior premolars placed very obliquely to the tooth-row and all the teeth closely crowded. It is of about the same size as *Paroligobunis* (*Brachypsalis*) *simplicidens* from the Lower Harrison, but has a larger second molar, a slightly larger sectorial and more closely crowded, obliquely placed anterior premolars.

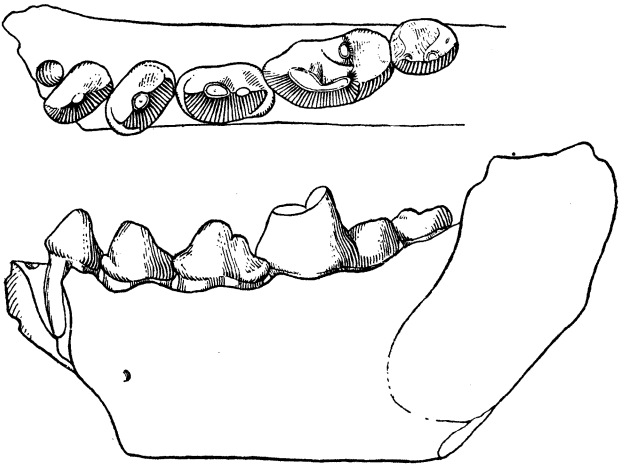

FIG. 3. *Brachypsalis obliquidens,* lower jaw, type specimen, external view, and crown view of the teeth, both natural size, No. 12070.

MEASUREMENTS.

Length, $p_{\overline{1}}$-$m_{\overline{2}}$	56
Length, $p_{\overline{1}}$-$p_{\overline{4}}$	32
Length, $m_{\overline{1}}$-$m_{\overline{2}}$	26
$p_{\overline{2}}$	9¾ × 6
$p_{\overline{3}}$	11 × 7
$p_{\overline{4}}$	13 × 7¾
$m_{\overline{1}}$	17½ × 9
$m_{\overline{2}}$	9 × 7½

MARTES GLAREÆ sp. nov.

Type No. 12071 Princeton University Geological Museum, collecting locality 1000C, the left ramus of the lower jaw with $p_{\overline{3}}$, $_{\overline{4}}$ and $m_{\overline{1}}$ and alveoli of the canine, $p_{\overline{1}}$, $_{\overline{2}}$ and $m_{\overline{2}}$ (Fig. 4). In size, close to the type of *M. ogygia* Matthew from Horizon E of the Upper Miocene of Colorado, but differing in the presence of $p_{\overline{1}}$ (represented by a small alveolus), the slightly larger, more laterally compressed $p_{\overline{3}}$ which lacks a posterior accessory cusp as in *ogygia* and some existing species, the presence of this cusp on $p_{\overline{4}}$ (only slightly less developed than in specimens referred to *M. americana* with which comparison was made), and the larger heel on $m_{\overline{1}}$. In both *M. ogygia* and *M. glareæ* the metaconid or $m_{\overline{1}}$ is more sharply separated than in specimens referred to *M. americana* which I have

examined. *M. minor* Douglass from near the bottom of the Lower Madison Valley Loup Fork beds and *M. furlongi* Merriam from the Thousand Creek beds, Thousand Creek, Nevada, are smaller forms, while *M. parviloba* Cope from the Middle Miocene of Colorado is a larger animal than either *ogygia* or *glareæ,* and *M. (Putorius) nambianus* from the New Mexican Loup Fork has a shorter jaw than either of the species just mentioned. It is approached in size by specimens in the Princeton University osteological collection referred to *M. americana,* but differs, in addition to the characters cited above, in the larger heels and heavier anterior basal ledges on the premolars and the greater degree of lateral compression of these teeth.

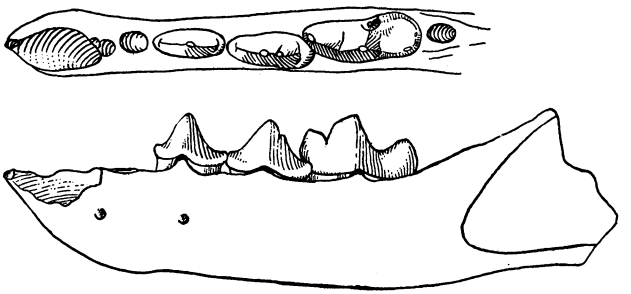

FIG. 4. *Martes glareæ,* lower jaw, type specimen, external view and crown view of the teeth, twice natural size, No. 12071.

MEASUREMENTS.

Length, p_3-m_1	17
p_3	5 × 2
p_4	5.8 × 2.1
m_1	8 × 3

PSEUDAELURUS near INTREPIDUS Leidy.

The presence in the Snake Creek fauna of a cat not far removed from *Pseudaelurus intrepidus* Leidy is indicated by a jaw fragment No. 12081 Princeton University Geological Museum, collecting locality 1000C, which agrees with Leidy's type fairly closely in the dimensions of the jaw, but differs in having the teeth a little smaller and the posterior accessory cusps and heels on the premolars less strongly developed. A further difference, which may be of little importance, is found in the position of the mental foramina which,

in *P. intrepidus*, occur below the alveolus for $p_{\overline{2}}$ and the anterior root of $p_{\overline{3}}$ respectively, while in the Snake Creek form they lie below the posterior root of $p_{\overline{3}}$ and a little in front of its anterior root. The alveolus for $p_{\overline{2}}$ is quite small and must have supported a minute vestigial single-rooted tooth.

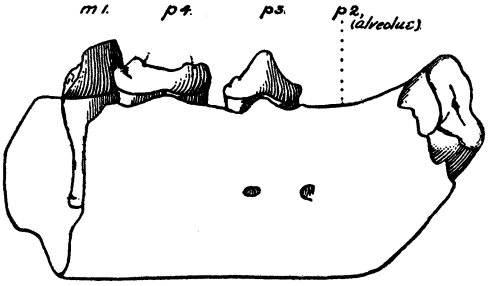

FIG. 5. *Pseudælurus* near *intrepidus*, lower jaw, right side, No. 12081, natural size.

FELID gen. et sp. indet.

A large non-machærodont cat is represented by a fragment of the left mandibular ramus No. 12073 Princeton University Geological Museum, collecting locality 1000A, in which are preserved the alveoli for three incisors, the base of a very large laterally flattened canine and alveoli for two premolars, a very small single-rooted $p_{\overline{2}}$ and a large double-rooted $p_{\overline{3}}$. The chin is not flanged but the symphysial region projects a short distance below the level of the lower border of the jaw.

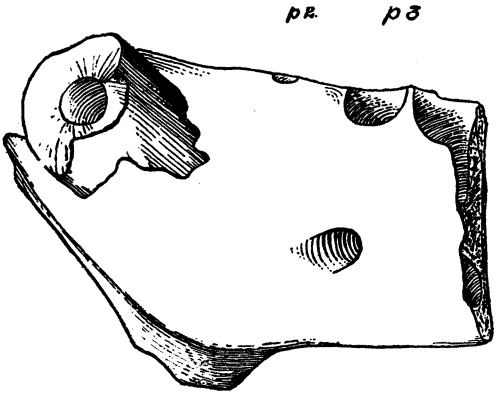

FIG. 6. Indeterminate felid, fragment of the lower jaw, left side, lateral view, No. 12073, natural size.

Edentate (?Megalonychid).

A single imperfect claw, "definitely recognizable as of Gravigrade relationship" and comparable "with some of the smaller Megalonychidæ" is reported by Matthew and Cook from the Snake Creek beds. Further confirmation of the presence of edentates is found in a navicular bone (Fig. 7) unquestionably of a Gravigrade, about two thirds the size of the navicular of *Megalonyx jeffersoni* and of much the same general type, obtained by the Princeton expedition at collecting locality 1000C.

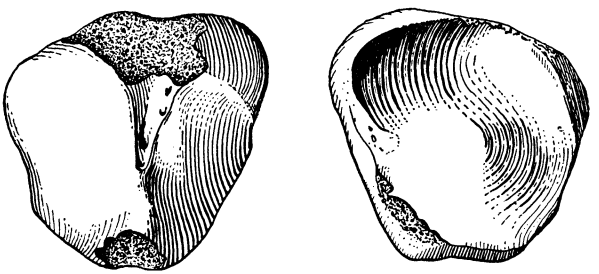

Fig. 7. Navicular bone of gravigrade edentate, upper and lower views, two thirds natural size, No. 12079.

Mastodons.

Mastodons of two types are indicated in the Princeton Snake Creek collection by several complete molars, most of which seem

Fig. 8. *Gomphotherium* sp., right last lower molar, one half natural size. No. 12064 Princeton University Geological Museum, collecting locality 1000 A.

referable to *Gomphotherium,* with a last lower molar carrying four cross-crests and a heel and having the intervening valleys blocked by large accessory tubercles (Fig. 8). A smaller form (Fig. 9), also with four cross-crests and a heel in $m_{\bar{3}}$, has the summits of the crests much more acute than in the *Gomphotherium* type and the valleys as free from accessory tubercles as in the corresponding tooth of *Mastodon americanus* to which the Snake Creek form is, possibly, related. Accessory ridges occur on the front and rear of the external half of each crest, but are no more strongly developed than in *M. americanus.* The last lower molar of the latter does not decrease in width posteriorly as rapidly as does the tooth here considered, but in other respects they closely resemble each other. The crown is unworn and there is no trace of cement.

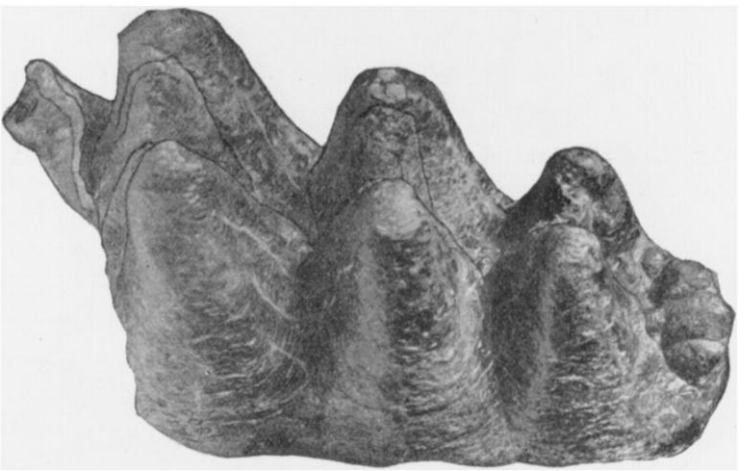

FIG. 9. *?Mastodon* sp., left last lower molar, two thirds natural size. No. 12116 Princeton University Geological Museum, collecting locality 1000 A.

INCERTÆ SEDIS.

A fragment of the left ramus of a lower jaw, No. 12091 Princeton University Geological Museum, collecting locality 1000A, has not been determined generically (Fig. 10). The specimen shows alveoli for two incisors and part of the root of a third. The first alveolus is very large and shallow and the second narrow and deep. The fragment of the root of the third incisor is strongly compressed

laterally and almost quadrangular in cross-section. These are followed after an intervening space, throughout which the dental margin of the ramus is broken, by a small, single-rooted, conical

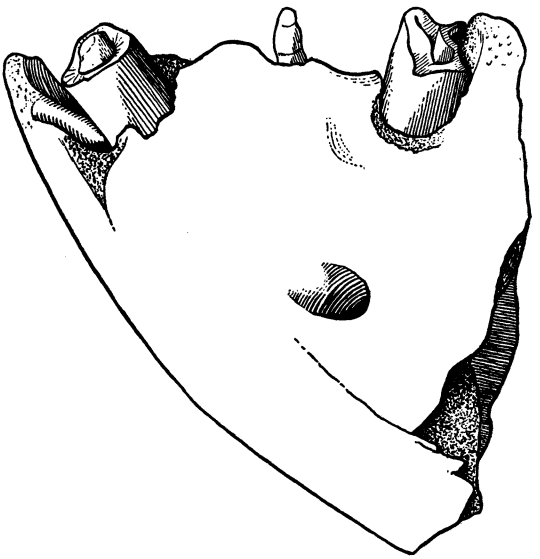

FIG. 10. *Genus incert. sed.* No. 12091, a fragment of the left ramus of the lower jaw, outer side, two thirds natural size.

tooth with enamel-covered crown. A second diastema, with undamaged margin, separates this tooth from the anterior root of a large, evidently deciduous tooth, beneath which, in the jaw, is the cavity for a still larger permanent tooth. The root of $i_{\overline{3}}$ seems to have projected into this cavity where it has been truncated by absorption. The symphysis is firmly fused, a small portion of the right ramus adhering to the left one and showing part of the alveolus for the first incisor of the right side.

MEASUREMENTS.

i_1, anteroposterior diameter of alveolus (approximate)	23
i_1, transverse diameter of alveolus (approximate)	18½
$i_{\overline{2}}$, anteroposterior diameter of alveolus (approximate)	6½
$i_{\overline{2}}$, transverse diameter of alveolus (approximate)	9
$i_{\overline{3}}$, anteroposterior diameter of root	16
$i_{\overline{3}}$, transverse diameter of root	9
?c, anteroposterior and transverse diameters	6

Length of diastema ?c-dp	15
Depth of jaw below middle of dp	107
Thickness of jaw at level of mental foramen	45

Archæohippus sp.

A small short-crowned $p\frac{2}{2}$ of the right side (No. 12128 Princeton University Geological Museum, colecting locality 1000B) agrees in structure with the upper teeth of *Archæohippus* in the complete union of the metaloph and ectoloph, the distinct protoconule, and open prefossette, there being no anterior median enamel fold on the wall of the metaloph. This horse has not been reported hitherto from any horizon above the Middle Miocene Mascall beds of Oregon.

Measurements.

Greatest anteroposterior diameter	13
Greatest transverse diameter	13

Pronomotherium siouense sp. nov.

Type No. 12057 Princeton University Geological Museum, collecting locality 1000C, the right ramus of the lower jaw with $p\frac{1}{1}$-$m\frac{3}{3}$ and alveoli of $i\frac{1}{1}$-c. Tooth crowns worn. A smaller form than

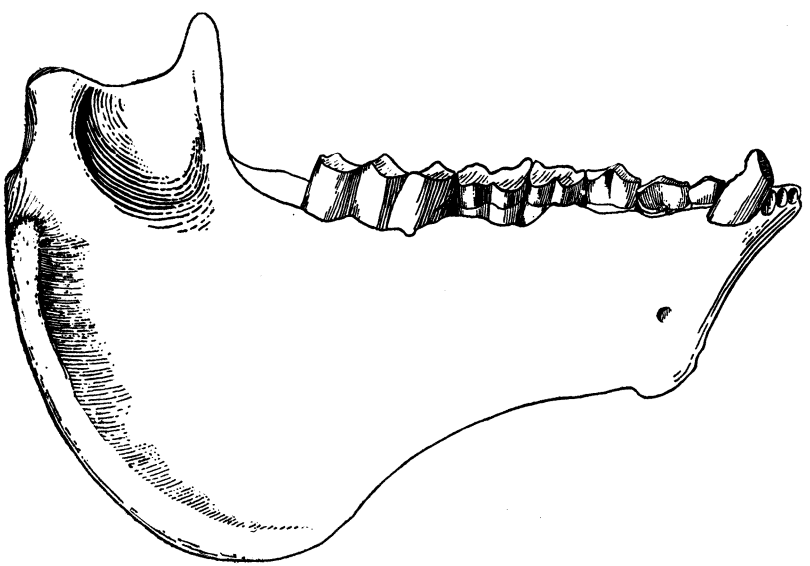

Fig. 11. *Pronomotherium siouense,* lower jaw, type specimen, external view, × ½.

either of the better known Miocene species (*P. laticeps* and *P. altiramis*) from which it can be separated by differences both in size and proportions.

MEASUREMENTS.

Length of jaw	208
Depth beneath p_3	57
Depth beneath m_1	53
Depth beneath back part of m_2	55
Depth beneath last lobe of m_3	94
Depth coronoid to angle	147
Length lower dental series	132+
Length lower premolar-molar series	125
Length lower premolar series	50
Length lower molar series	75

PROTOLABIS PRINCETONIANUS sp. nov.

Type No. 12053 Princeton University Geological Museum, collecting locality 1000C, an uncrushed skull, sand-worn on the right side which lay uppermost, associated with most of the left ramus of the lower jaw, a fragment of the right ramus and an ulna-radius. The limb bone belongs to a camel but may not pertain to the same individual as the skull. In size, there is close agreement with *Protolabis longiceps* Matthew from the Colorado Loup Fork (Pawnee Creek beds), but a comparison of the two skulls brings out certain minor differences which appear to be of specific value. In *P. princetonianus,* the anterior facial vacuity is far larger than in the Colorado form, with the premaxillæ extending above it and reaching farther back than in that species. Another marked difference appears in the absence of an abrupt constriction of the face in front of p^2 which produces the sudden incurving of the tooth row seen in *longiceps* in contrast with the gradual taper of this region in the Princeton specimen. Various differences in dental structures are also noticeable, as follows: p^2 thicker and heavier and p^3 less reduced and with posteroexternal groove deeper than in *P. longiceps;* p^4, if anything, larger in *longiceps* than in *princetonianus.* Lower premolars somewhat less reduced and molar crowns somewhat higher, and posteroexternal groove in p_4 placed nearer hinder end of tooth than in *longiceps;* p_3 with distinct anterior cusp which is absent in the last named form.

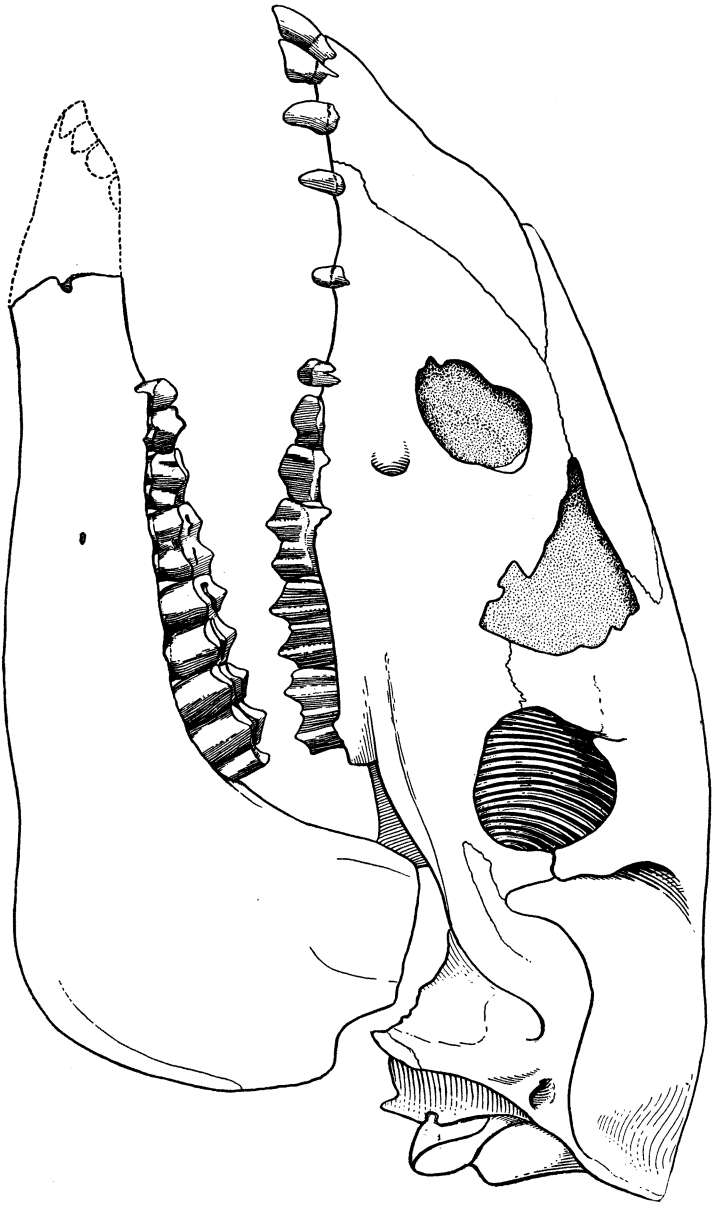

FIG. 12. *Protolabis princetonianus*, type specimen, left side of skull and lower jaw, one half natural size, No 12053. Symphysis of lower jaw restored in outline from another specimen of the same species.

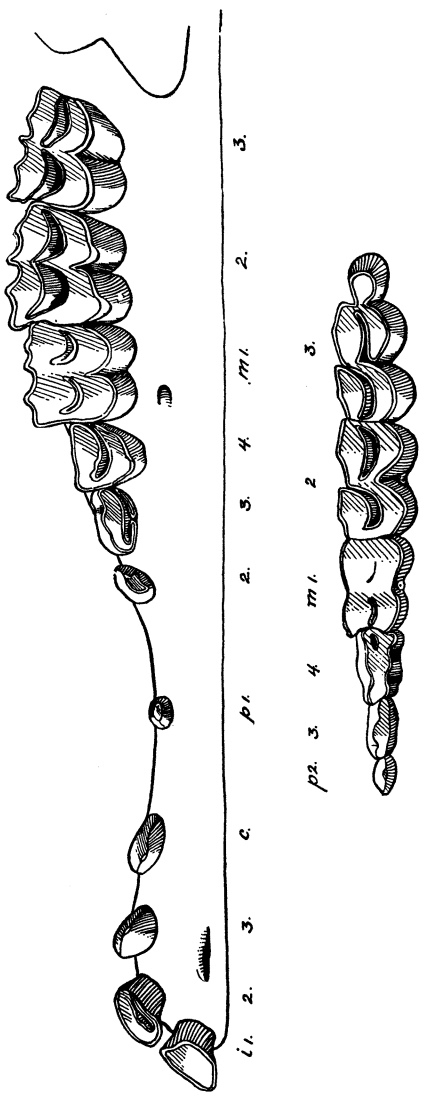

FIG. 13. *Protolabis princetonianus*, type specimen, crown view of the upper and lower teeth, two thirds natural size, No. 12053.

MEASUREMENTS.

Total length of skull (incisors to condyles)				310
Length, $i\text{-}_1m^3$	right	195,	left	199
Length, $p^1\text{-}m^3$	right	121,	left	127
Length, premolar series	right	59½,	left	64
Length, diastema behind i_3	right	11,	left	9
Length, diastema behind c		18		
Length, diastema behind p^1	right	18,	left	20
Length, lower premolar-molar series				106
Length, lower premolars				33
Depth of jaw in front of p_2				32
Depth of jaw below middle of m_3				40
Length of radius				195
Width of radial shaft at middle				24

DREPANOMERYX FALCIFORMIS gen. et sp. nov.

Type No. 12072 Princeton University Geological Museum, collecting locality 1000C, a horn of the left side (lacking tip) and the basal portion of the right horn (Figs. 14, 15).

Frontal not cavernous at base of horns. Horns non-deciduous, rising immediately above upper posterior margin of orbit, sloping backward and upward and at the same time curving inward, at base almost circular, but flattening upward in the transverse plane extending backward and inward from the orbits, producing a scimitar-like structure which curves inward toward its fellow on the opposite side. Horns without any suggestion of twist, proximal half comparatively smooth and free from pits and irregularities, such faint groovings as are present being longitudinal. Distally, and especially toward the outer margin, the surface is rough and pitted, but this seems to be due to sand-blasting or water-wear which has destroyed the outer table of bone. A broad groove is visible throughout the central portion of the shaft on the posterior aspect of the horn. Horns solid throughout, the surface, texture resembling that of the Pronghorn Antelope.

No teeth have been found in the Snake Creek beds which can be referred, even provisionally, to the new form, unless those which have been correlated by Matthew and Cook with their *Neotragocerus improvisus,* and the lower jaw described under that genus in the present paper, should be associated with the curved type of horn found in *Drepanomeryx* rather than with the straight horns of *Neotragocerus.*

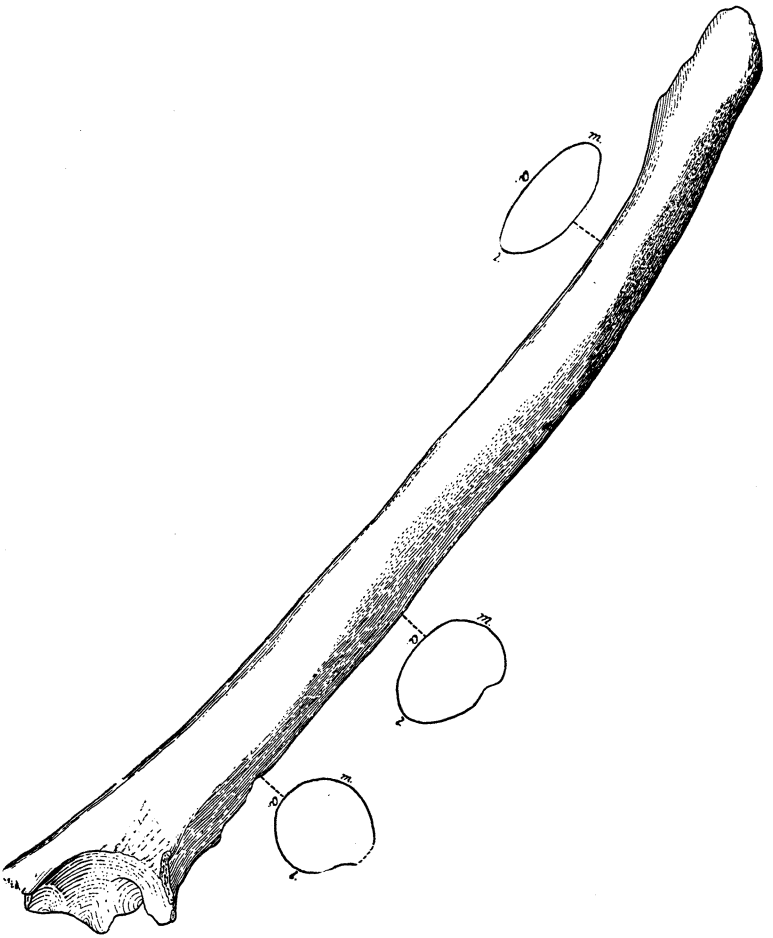

FIG. 14. *Drepanomeryx falciformis,* type specimen, lateral aspect of the left horn, one half natural size, No. 12072. *l, m, a* in cross-sections = lateral, median and anterior margins.

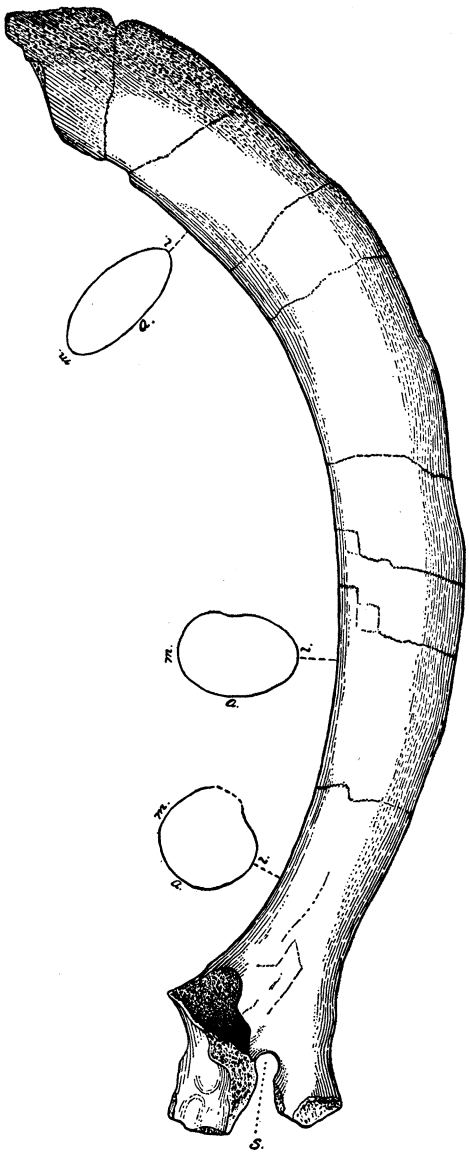

FIG. 15. *Drepanomeryx falciformis*, type specimen, anterior aspect of the left horn, one half natural size, No. 12072. *l*, *m*, *a* in cross-sections = lateral, median and anterior margins; *s*, supraorbital foramen.

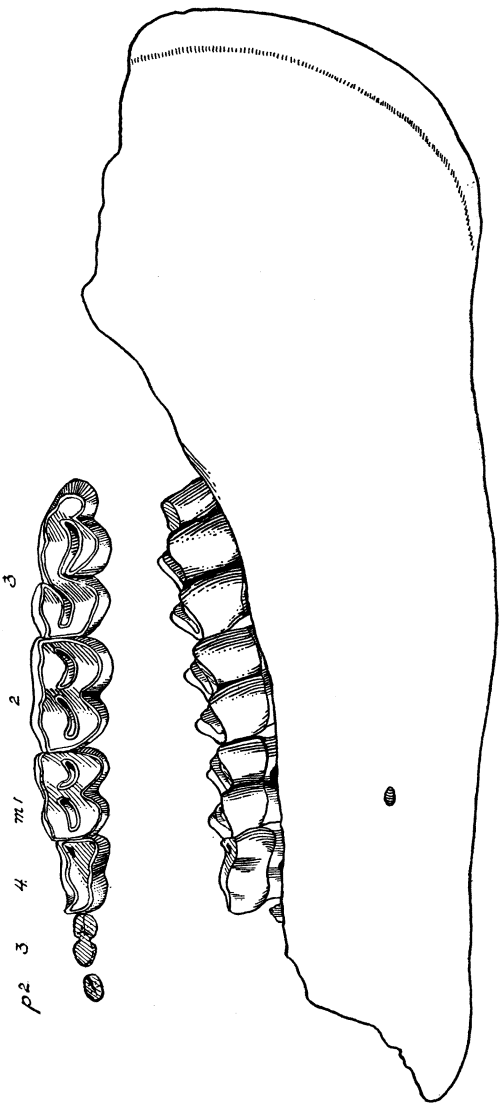

FIG. 16. *?Neotragocerus improvisus*, left ramus of the lower jaw, side view, and crown view of the teeth, two thirds natural size, No. 12106.

NEOTRAGOCERUS IMPROVISUS Matthew and Cook.

The left ramus of a lower jaw (No. 12106 Princeton University Geological Museum, collecting locality 1000C), which is doubtfully referred to this form, supports brachyodont molars which register almost exactly with the upper teeth selected by Matthew and Cook as paratypes of *Neotragocerus improvisus*. With the discovery in the Snake Creek beds of scimitar-shaped horns (*Drepanomeryx* gen. nov.), presumably of antelope-like animals, correlation of the straight *Neotragocerus* type of horn with jaw fragments, both upper and lower, supporting short-crowned teeth becomes even more provisional than it has hitherto been, since either type of horn is large enough to fit an animal of the size of those to which the jaws belonged.

DROMOMERYX WHITFORDI sp. nov.

Type No. 12054 Princeton University Geological Museum, collecting locality 1000C, an associated pair of horn bases (Fig. 17). Paratype No. 12086 Princeton University Geological Museum, the right ramus of a lower jaw, unassociated with the horns but from the same collecting locality (Fig. 18). The species is named in honor of my assistant in the field, Mr. A. C. Whitford. Horn bases about one third wider than in *D. borealis,* with the posterior upper corner of the wing-like expansion at the base of the horn

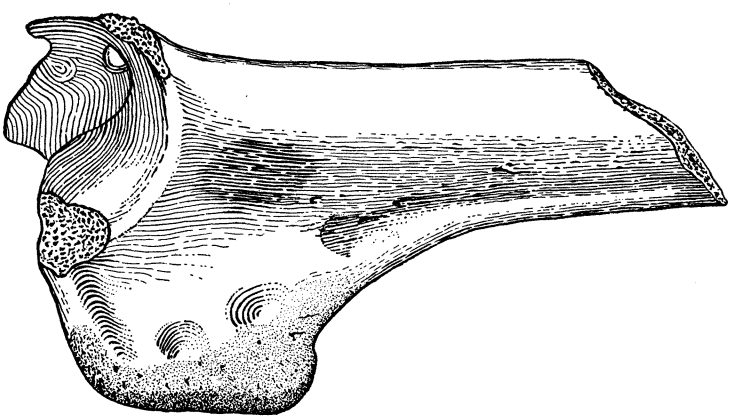

FIG. 17. *Dromomeryx whitfordi,* type specimen, base of left horn, outer side, two thirds natural size. One of an associated pair, No. 12054.

sharply angular instead of a flowing curve as in *D. borealis*. Lower jaw of practically the same size as in that species and dentition not specifically separable therefrom.

The inclusion in the same new species of type material not found associated is most unsafe. In this instance it seems justifiable because the collections made by two parties (American Museum and Princeton) have shown the presence of but one species of *Dromomeryx* in the Snake Creek beds, the so-called *Palæomeryx* of Matthew and Cook being undoubtedly *Dromomeryx* and not separable from the new species here described.

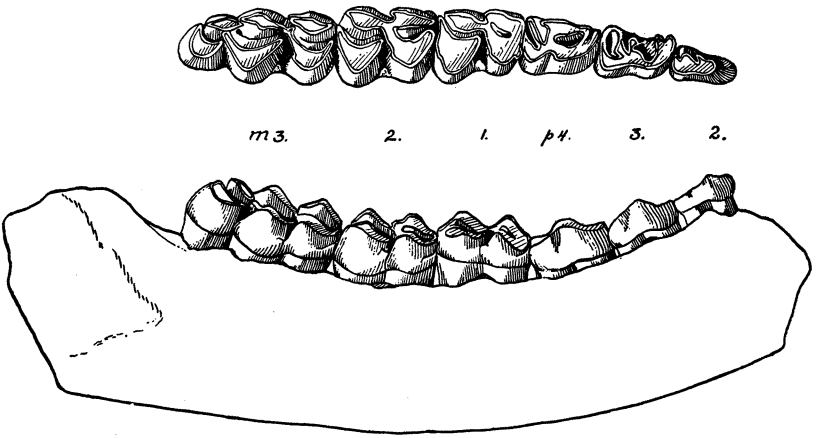

FIG. 18. *Dromomeryx whitfordi*, paratype, right ramus of the lower jaw, side view, and crown view of the teeth, two thirds natural size, No. 12086. The distance from p_2-m_3 is a little greater in the crown view, owing to elimination in the drawing of the fore-shortening due to curvature of dental series.

MEASUREMENTS.

Width of horn-base across middle of wing-like process	73
Anteroposterior diameter of beam three inches above base ...	30
Transverse diameter of beam three inches above base	25
Legnth, p_2-m_3 measured as chord of arc	109
Length, m_1-m_3	67½
p_2, anteroposterior 12⅓, transverse	6⅔
p_3, anteroposterior 14½, transverse	10
p_4, anteroposterior 15, transverse	10½
m_1' anteroposterior 17, transverse	14
m_2' anteroposterior 19½, transverse	15
m_3, anteroposterior 31, transverse	15
Depth of jaw beneath p_3	31
Depth of jaw beneath m_3	31½

PRINCETON UNIVERSITY, April, 1915.